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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/329,156 06/09/99 QU

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002352 MMC2/0228
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EXAMINER

HU, S

ART UNIT

PAPER NUMBER

2811

DATE MAILED:

02/28/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/329,156

Applicant(s)

Qu et al.

Examiner

Shouxiang Hu

Group Art Unit
2811



☒ Responsive to communication(s) filed on Dec 6, 2000

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire three month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) 1-12 is/are pending in the applicat

Of the above, claim(s) _____ is/are withdrawn from consideration

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-12 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s) _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1 recites the limitation that the first surface, the first and the second layers have generally coincident boundaries, and claim 10 recites the limitation that the layer and the upper surface have generally coincident boundaries. But it is not clear as to what type of boundary or boundaries the first surface or the upper surface can have, and what are the two sides that form each of the boundaries. In addition, the word "coincident" may mean "occupying the same area in space." However, according to Applicant's disclosure, there are no two boundaries occupying the same area in space.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-9, insofar as in compliance with 35 U.S.C. 112, are further rejected under 35 U.S.C. 102(b) as being anticipated by Merrill et al. (5,661,314).

Merrill et al. (5,661,314) disclose a semiconductor device (Figs. 4, 19 and 20), comprising: a silicon substrate (51); a first epitaxial silicon layer (52); a second epitaxial silicon layer (180); and a plurality of opposite type diffusion regions (81), wherein the boundary between the silicon substrate (51) and the first epitaxial silicon layer (52) conforms with or is very similar to (as the word "coincident" may have the meaning of "being very similar to another") the boundary between the first and the second epitaxial silicon layers (52 and 180); the first layer (52) is thicker than the second layer (180) (see col. 9, lines 13-27, and col. 14, lines 55-65); and, the doping concentration is higher in the second layer than in the first layer.

Regarding claim 9, Merrill et al. further disclose that the invention can also be applied to MOSFET (see col. 1, lines 10-25)

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 10-12, insofar as in compliance with 35 U.S.C. 112, are rejected under 35 U.S.C. 103(a) as being obvious over Merrill et al. (5,661,314).

The disclosure of Merrill et al. (5,661,314) is discussed as applied to claims 1-9 above. Although Merrill et al. (5,661,314) do not expressly the doping concentrations in the first and the second layer forming a graded profile, it is noted that it is well known in the art that the doping concentrations can be graded from one layer to another if these two layers have the same type conductive doping but with different average doping concentrations (as evidenced in the prior art such as Chang et al. (4,803,533). Beside, the doping profile is a well recognized parameter of importance subject to routine experimentation and optimization.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to make the semiconductor device of Merrill et al. (5,661,314) with the doping concentrations in the first and the second layer forming a graded profile through routine experimentation and optimization, so that low on-resistance and high breakdown voltage can be achieved.

Response to Arguments

4. Applicant's arguments filed on 11/6/200 have been fully considered but they are not persuasive.

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With respect to Applicant's argument that Merrill teaches away from the present invention as Merrill's device uses a first layer with a lower resistivity and thinner than the second layer, it is noted that Merrill's second layer (180) is doped more heavily than in its first layer (52), which makes the resistivity in the second layer inherently lower than the one in the first layer; and it is further disclosed in Merrill that the thickness of the first layer (52) can be in the range of 35 to 100 um (see col. 9, lines 13-27), while the thickness of the second layer (180) is about 7 um.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References A-C are cited as being related to the structure of a MOSFET device.
6. Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 or 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Shouxiang Hu** whose telephone number is (703) 306-5729. The examiner can normally be reached on Tuesday through Friday from 7:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Tom Thomas**, can be reached on (703) 308-2772. The appropriate fax phone number for the organization where this application or proceeding is assigned is (703) 308-7724.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is (703) 308-0956.

Shouxiang Hu
February 22, 2001



TOM THOMAS
SUPERVISORY PATENT EXAMINER